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I also certify that the attached copy of the request for grant of a Patent (Form 1/77) bears an amendment, effected by this office, following a request by the applicant and agreed to by the Comptroller-General.

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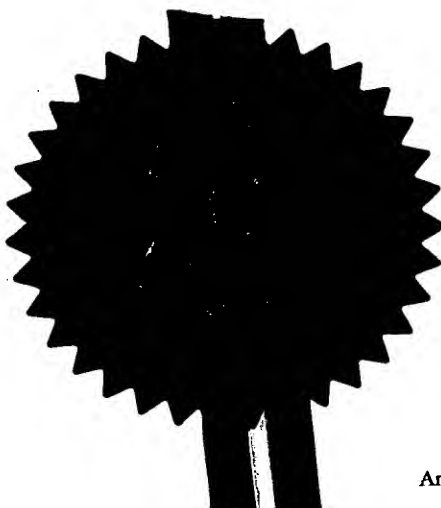
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Signed

Andrew Gersey

Dated

7 January 1999



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P01/7700 25.00 - 9726154.9

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# Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

1. Your reference

C1283/P

2. Patent application number

(The Patent Office will fill in this part)

**9726154.9**

3. Full name, address and postcode of the or of each applicant (underline all surnames)

PetroTechnik Limited  
Maitland Road  
Lion Barn Business Park  
Needham Market, Ipswich  
Suffolk IP6 8NZ

Patents ADP number (if you know it)

06433585001

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

4. Title of the invention

Improvements in and relating to pipe fittings

5. Name of your agent (if you have one)

Keith W Nash & Co  
90-92 Regent Street  
Cambridge  
CB2 1DP

SOMMERVILLE & RUSHTON  
45 GROSVENOR ROAD  
ST ALBANS  
HERTS  
AL1 3AW

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Patents ADP number (if you know it)

1206001

1511001

Form 51  
26/11/98

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

YES

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

c)

## Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document.

Continuation sheets of this form

Description

10

Claim(s)

-

Abstract

-

Drawing(s)

3

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*)

Request for substantive examination (*Patents Form 10/77*)

Any other documents  
(please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature Keith W Nash & Co Date 10.12.97

Keith W Nash & Co, Agents

12. Name and daytime telephone number of person to contact in the United Kingdom
- Mr D L Roberts 01223 355477

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### Notes

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C1283/P

TITLE: IMPROVEMENTS IN AND RELATING TO PIPE FITTINGSField of the Invention

This invention relates to a fitting for providing a seal between a wall and a pipe passing through an opening in the wall, to a method of providing such a seal, and to the combination of a pipe, a wall and a fitting providing a seal between the two. The invention is particularly applicable to the provision of a seal between a pipe and a wall for a manhole chamber for a subterranean fuel tank or sump for a dispensing pump, for example in a petroleum forecourt installation.

Background to the invention

In petroleum forecourt installations, pipework running between dispensing pumps and a subterranean fuel storage tank passes into a manhole chamber which is situated directly above the manhole lid of the tank. The chamber is normally defined by an upstanding wall which, when viewed from above, can be of an octagonal, square or rectangular shape, and which includes apertures through which respective pipes pass.

It is desirable to provide a seal between each of the apertures and its respective pipe to avoid ingress of water into the manhole chamber. To that end, it is known to attach a fitting to a portion of the wall around the aperture and a rubber "boot" that sleeves over the pipe and is clamped to both the pipe and the fitting by, for example, jubilee clips. Some examples of fitting are bolted to the chamber wall, whilst other types of fitting provide inner and outer parts between which the wall is sandwiched, the inner and outer parts being held together by a screw-threaded connector which extends through the aperture.

Neither type of fitting provides a completely effective seal.

Consequently, both types of seal can allow water to leak into the manhole chamber and to accumulate in a pool in the bottom of the chamber. This in turn makes the maintenance of the chamber bottom and tank entrance extremely difficult and prohibitive.

Furthermore, it has been found that the removal and replacement of the rubber seals of conventional arrangements can also be extremely difficult and expensive.

### Summary of the Invention

According to a first aspect of the invention, there is provided a fitting for providing a seal between a wall and a pipe passing through an opening in the wall, the fitting comprising a sleeve through which, with the fitting installed, the pipe passes, said sleeve, when installed, being sealed to the pipe, a surface which extends from the sleeve and is so shaped as to be able to be placed against the wall so as to surround said opening therein, and energy transfer means for enabling the surface or wall to be heated to cause the surface and wall to be fused or bonded together to seal the fitting against the wall.

It is believed that water which leaks through conventional fittings and seals does not pass between the sealing member, for example the rubber gasket seal, and the pipe, but instead passes between the fitting and the wall. By contrast, the present invention provides a fitting which, when installed, is ~~sealed to the wall around the aperture, and which does not~~ require attachment to the wall by any invasive method, for example bolts, which would require further apertures in the wall. Thus, a seal formed using a fitting in accordance with the present invention should be substantially watertight or at least far more effective than the seals provided by conventional fittings.

Preferably, the surface is of a fusible material, such as a thermoplastic (for example polyethylene) which, when heated via the energy transfer means, at least partially melts, causing the fitting and the wall to be fused together.

Preferably, the energy transfer means comprises conduction means for conducting an electric current, said conduction means in use, being heated by the current, to cause said heating of the surface.

The process by which two components are fused together as a result of electrical heating from a conductor (situated at or near the interface between the two components prior to fusing) is known as electrofusion. Electrofusion is normally used to provide seals at the join between two lengths of pipe, (particularly polyethylene pipe) in a pipeline. The same process can be used by a fitting in accordance with the present invention if the wall to which the fitting is to be fused is of a suitable thermoplastic material, such as polyethylene.

It is however possible for the fitting to be required for a wall which is of a material, for example fibreglass, which is not suitable for being attached to the fitting by electrofusion. In this case, therefore, the surface of the fitting preferably comprises an adhesive which is of a type which is activated by heat, wherein the heating of the surface by the energy transfer means activates the adhesive and thereby bonds the fitting to the wall. The adhesive can be a thermoplastic, thermoset, cross-linking or pressure sensitive adhesive.

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This type of fitting can be attached to a wall by a procedure similar to that used by the fitting which is bonded to a wall by electrofusion.

Preferably, the conduction means comprises a wire which is conveniently embedded within the surface. The surface may to

advantage be part of a flange which extends from the sleeve. Where the sleeve is of a substantially circularly symmetric cross-section, the flange is preferably radial.

If the energy transfer means comprises conduction means, the fitting preferably includes terminals, for connecting the conduction means to a current supply, which are accessible from the opposite side of the flange from the surface.

According to a second aspect of the invention, there is provided a fitting in accordance with the first aspect of the invention and a sealing member for sealing the sleeve of the fitting to a pipe passing therethrough. The sealing member may be incorporated into the sleeve, or may be formed as an initially separate fitting which is subsequently attached to the sleeve after the fitting has been installed.

Preferably, the sealing member is resilient, and there is provided clamping means (such as jubilee clips) for clamping the sealing member to the pipe and/or the sleeve. Conveniently, the sealing member comprises a rubber sleeve.

According to a third aspect of the invention, there is provided a method of providing a seal between a pipe and a wall having an opening through which the pipe passes, the method comprising the steps of applying a fitting to the pipe, the fitting having a sleeve through which the pipe passes and a surface which is placed against a portion of the wall around the opening so as to surround the latter; heating the surface and/or said portion of the wall thereby to cause the wall and the surface, and hence the fitting to become fused or bonded together, and sealing the sleeve to the pipe before, during or after said heating step.

Preferably, said heating is achieved by passing an electric current through conduction means in the vicinity of the portion



of the wall and the surface. The conduction means may be provided on the wall, but is preferably carried by the surface.

Conveniently, the materials constituting the wall and the surface are such that the surfaces are fused together by a process of electrofusion.

Where other materials are used, however, the method also includes providing an adhesive which is activated by said heating to cause the fitting to be bonded to the wall. The adhesive may form the surface on the fitting. Additionally or alternatively, the adhesive may be provided on the wall.

Preferably, the wall comprises a manhole chamber wall for a subterranean fuel tank.

The invention also lies in a manhole chamber for a subterranean fuel tank, a pipe which passes through an aperture in the wall of the chamber, a fitting having a sleeve through which the pipe passes, the fitting being placed against the wall so as to surround the aperture, energy transfer means for heating the fitting and/or the chamber to cause the fitting and/or chamber to be fused or bonded together in a region which surrounds the aperture, and a sealing member for sealing the pipe to the sleeve.

According to a further aspect of the invention, there is provided a pair of components adapted to be bonded together wherein one of the components carries a heat activated adhesive and the components also include energy transfer means for heating the adhesive to enable the components to be bonded together.

#### Brief Description of the Drawings

The invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a partially cut-away side view of part of a petroleum forecourt installation which includes a tank having a manhole chamber, having a fitting in accordance with the invention;

Figure 2 is a cut-away side elevation, to an enlarged scale, showing the fitting in position on the manhole chamber wall;

Figure 3 is a front elevational view of the fitting (prior to installation); and

Figures 4 and 5 are sectional side views of two further embodiments of fitting in accordance with the invention, each drawing showing the fitting when installed.

#### Detailed Description

The petroleum forecourt installation shown in Figure 1 comprises a pair of dispensing pumps 1 and 2 connected to a subterranean tank 3 through a pipeline 4. The pipeline 4 is formed from contiguously arranged sections of polyethylene pipe. The pipeline 4 extends from the pumps 1 and 2 into a manhole chamber 6 immediately above the tank 3. The chamber 6 is defined by a polyethylene member 8 having a side wall 10 and a base 12.

Figure 1 shows two lines extending from the pipeline 4 into the tank 3. These lines relate to two alternative forms of fuel supply system and are both shown for the sake of completeness.

~~In practice, only one of the lines would extend from the~~  
pipeline 4 into the manhole chamber 6. One of those lines is a suction line 14 which is used where the dispensing pumps 1 and 2 are fitted with suction pumps. The alternative line, reference 16, is a pressure line connected to the pipeline 4 via a pump 18 which is operable to propel fuel from the tank 3 to the pumps 1 and 2.

It can be seen from Figure 1 that the wall 10 has to be apertured in order to allow the pipeline 4 to pass into the chamber 6. In order to prevent water leaking from the surrounding ground (here denoted by reference numeral 20) into the chamber 6 through the aperture, the pipe is sealed to the cylindrical wall 10 by means of a fitting 22 shown in more detail in Figures 2 and 3.

The fitting comprises a cylindrical sleeve 22 having an outwardly projecting radial flange 24 at one end. The flange and sleeve define a central passage through which the pipe of the pipeline 4 extends. It can also be seen from Figure 2 that the sleeve extends through the aperture in the wall 10 so that the sleeve is at least partially accommodated within the chamber 6, whilst the flange 24 is situated outside the chamber.

The flange 24 has a surface 26 which is flat, to enable the surface to be placed against the wall 10 as shown in Figure 2. Accordingly, the flange 24 makes contact with the wall 10 in a region which surrounds the opening through which the pipe of the pipeline 4 passes. A wire 28 is embedded in the surface 26 in a generally spiral shape as shown in Figure 3, and the ends of the wire 28 are connected to electric terminals 30 and 32.

The sleeve 22 also receives a rubber boot 34 which is clamped at one end over the sleeve by a jubilee clip 36. The opposite end of the boot 34 is clamped onto the pipe of the pipeline 4 by a jubilee clip 38.

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When the fitting (constituted by the sleeve 22 and flange 24) is installed, the flange 24 is initially pressed against the wall 10 and the terminals 30 and 32 connected to a source of electric current. The current passes through the wire 28, causing the latter to heat the adjacent surface of the flange 24 (and part of the tank 10), to cause the flange 24 and wall

10 to fuse together in a disc-shaped region which surrounds the opening in the tank 10. This not only retains the fitting on the wall 10 but also provides a seal which encircles the opening in the tank, and thus prevents water passing between the flange and the wall 10 through the opening of the latter into the chamber 6. The passage of any water which travels along the surface of the part of the pipe outside the chamber 6 will be blocked by the seal 34.

If the chamber wall were to be made of fibreglass, a modified version of fitting would be used. The modified version is identical to the version shown in Figures 2 and 3, apart from the inclusion of a layer of adhesive which would constitute the surface 26 on the flange 24 and which overlies the heating wire. The adhesive is a thermoplastic or cross-linking adhesive which once heated, forms a bond between the flange 24 and the wall 10. Again, since the bond will surround the opening in the wall 10, it also acts as a seal to prevent the ingress of water.

It will be appreciated that various modifications to the fitting and/or chamber wall are possible within the scope of the invention. Thus, for example, the wire 28 could be embedded in the chamber wall 10, and the latter could carry the adhesive coating instead of, or in addition to, the fitting 24.

Figures 4 and 5 show alternative forms of fitting when installed on the chamber wall 10.

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The fitting shown in Figure 4 has an outer circular back plate 40 which is formed as a radial flange on a sleeve 42, and which carries a spiral winding of a wire 44 connectable to an electric current source by means of terminals 46 and 48.

The flange 40 and sleeve 42 are formed of a thermoplastics material which can be fused to the (thermoplastic) wall 10 in a similar fashion to the fitting shown in Figure 2.

Alternatively, either the flange 40 or wall 10 can carry a heat activated adhesive if the wall 10 is of a material not suitable for electrofusion welding.

The outer surface of the sleeve 42 carries a screw-threaded portion which enables the sleeve, and hence the flange, to be screwed onto an outer sleeve 50 from which a further radial flange 52 projects. The flange 52 is pressed against the inside of the wall 10, and includes a circular groove which accommodates an O-ring seal 54 for preventing the ingress of any water which manages to breach the seal between the flange 40 and outside of the wall 10.

The sleeve 50 carries a rubber boot 56, clamped to the sleeve by a jubilee clip 58. The boot is also clamped to the pipe of the pipeline 4 by a jubilee clip 60, and serves a similar purpose to that of the boot 34.

As the outside of the fitting (i.e. flange 40 and sleeve 42) is securely bonded/fused to the wall 10, the removal of the sleeve 50 (and flange 52) for repair or maintenance can be readily done without the need to have any access to the exterior of the wall 10.

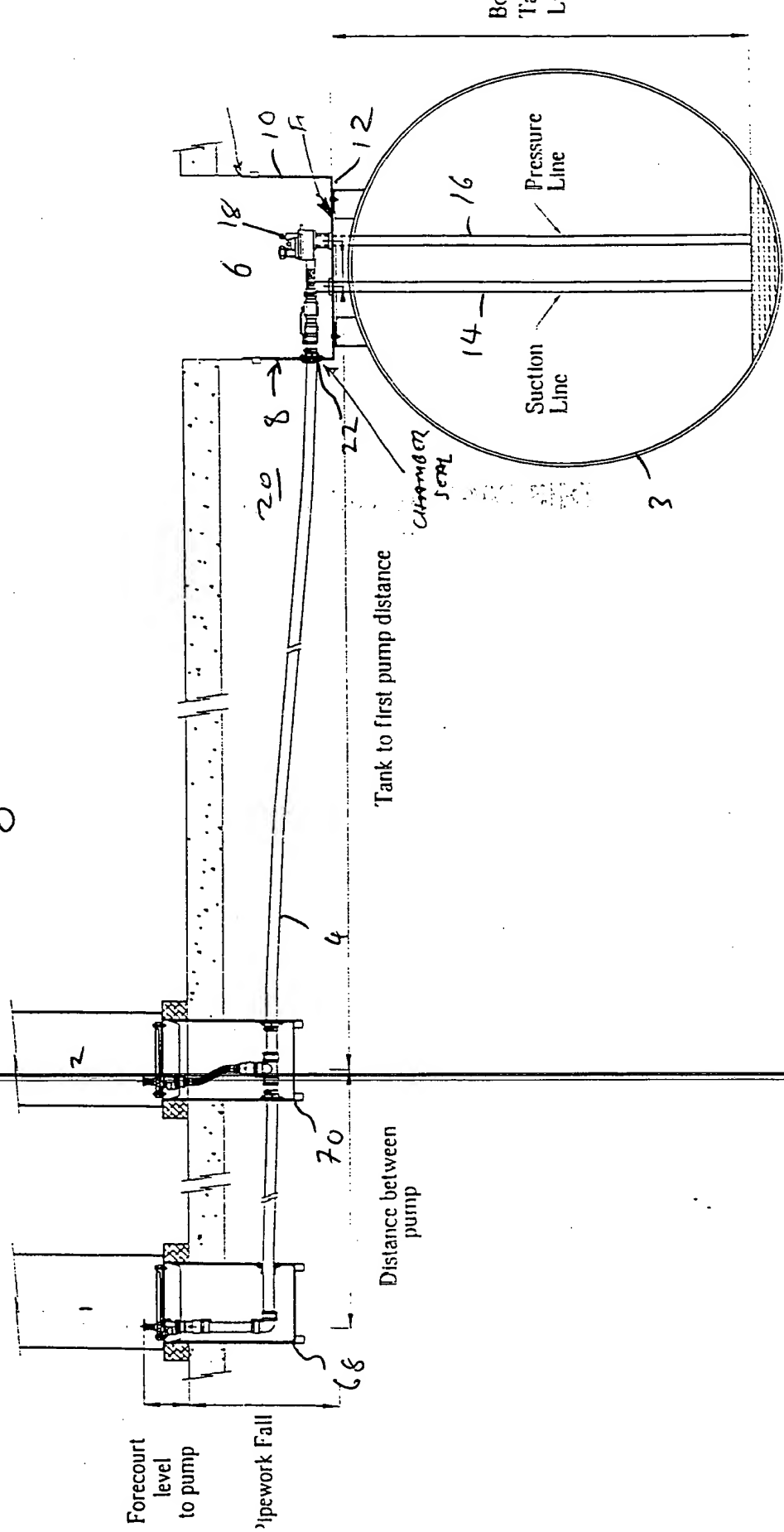
Figure 5 shows the same fitting when modified to accept a pipeline which uses secondary containment (in which fuel is conveyed along an inner pipe 62 which extends through an outer pipe 64). It can be seen that the only modification to the fitting is to the boot seal, and associated jubilee clips which are now arranged to provide a seal between the fitting and both the pipes 64 and 62 (three jubilee clips 60, 60' and 58 are used to that end). It can be seen that the boot 56 is also configured to accommodate part of a leak detection sensor for detecting any leaks of fuel from the inner pipe 62 into the interstitial space between the pipes 62 and 64.

A similar arrangement of fittings to those shown in Figures 2,

4 or 5 are used to seal the pipeline 4 to each of a pair of sumps 68 and 70 (which are rectangular in plan) beneath the pumps 1 and 2 respectively. A respective fitting is installed on the sumps 68 and 70 about each aperture (in the sumps) through which the pipeline 4 passes.

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Fig 1



Total Head = Static Head + Dynamic Head

= (Bottom of Tank to Lid + Pipework Fall + Forecourt Level to Pump) + (Pipework Assembly Friction Losses)

Figure 1

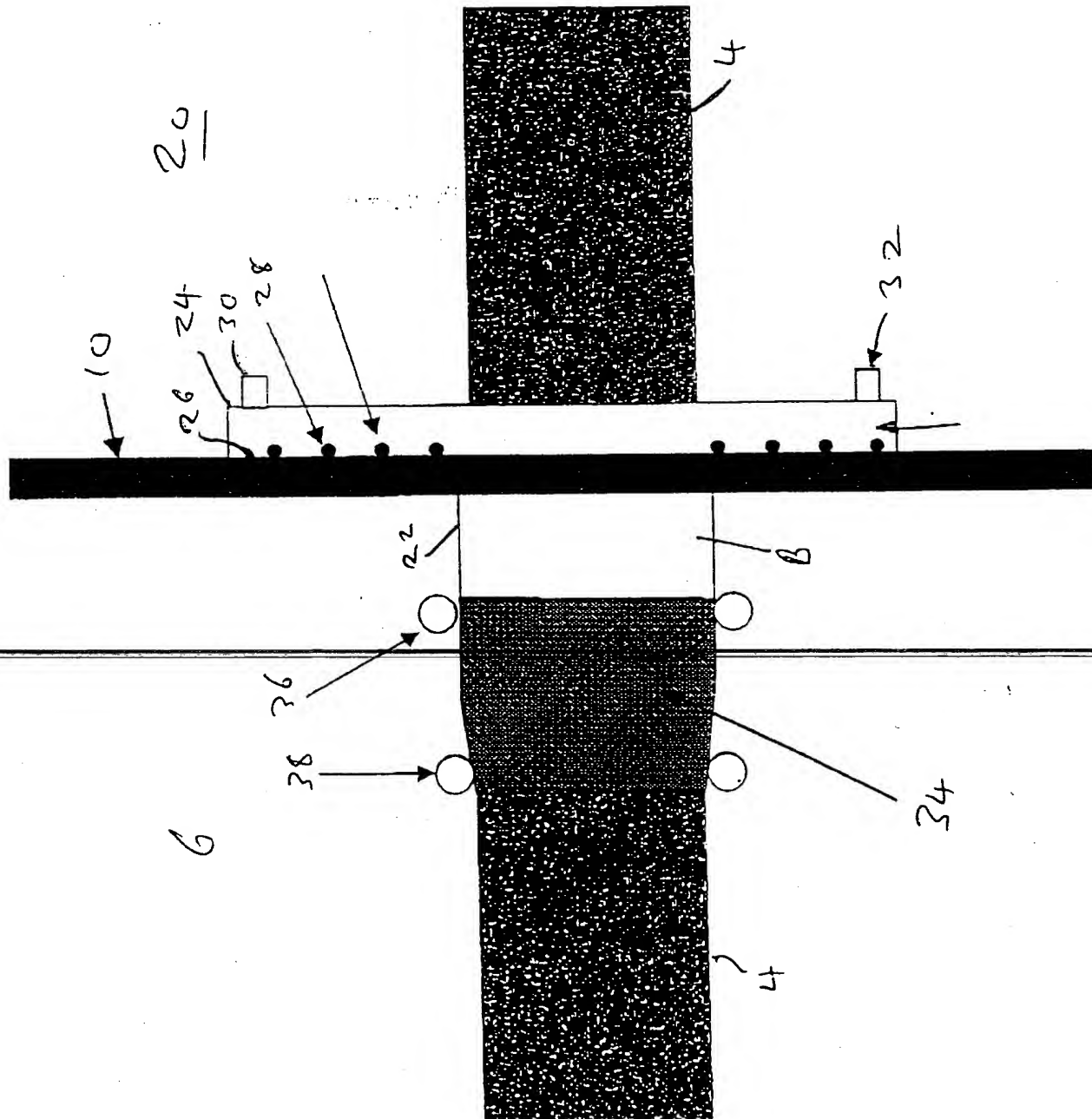
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TYPICAL FORECOURT FUEL SUPPLY SYSTEM LAYOUT		1		2		1		1		01/10/79	
PETROTECHNIK LTD.		D. H. Allen		D. H. Allen		D. H. Allen		D. H. Allen		D. H. Allen	
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Fig 2



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2/3

Fig 4

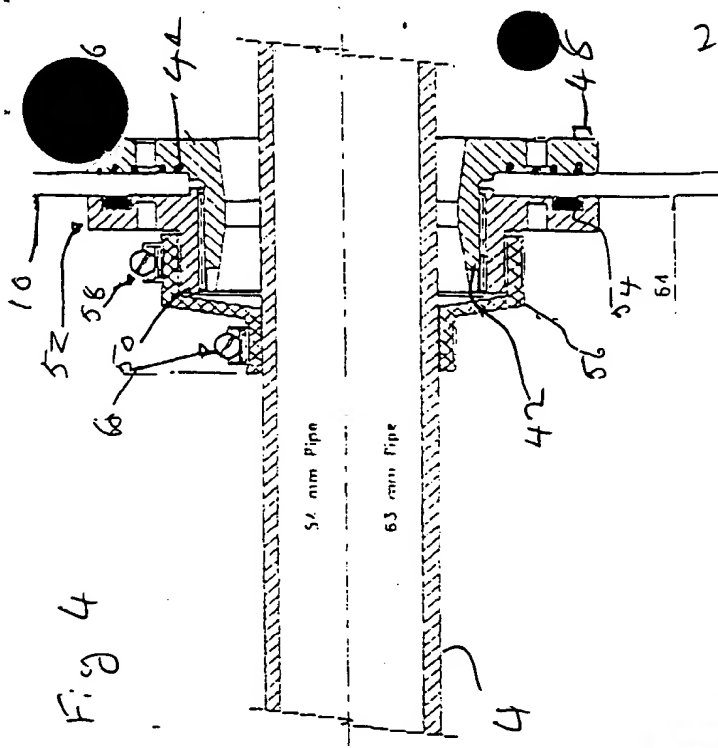
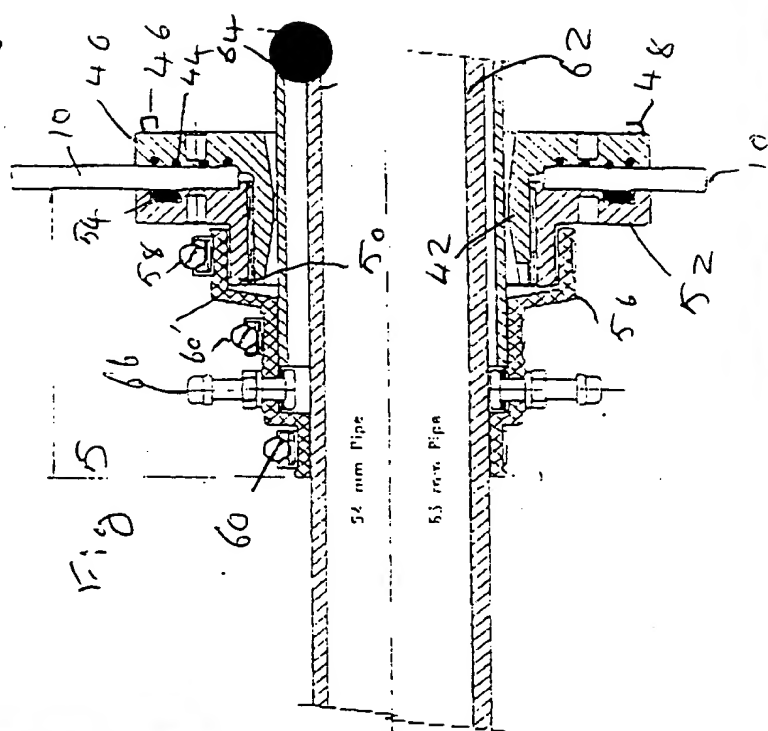


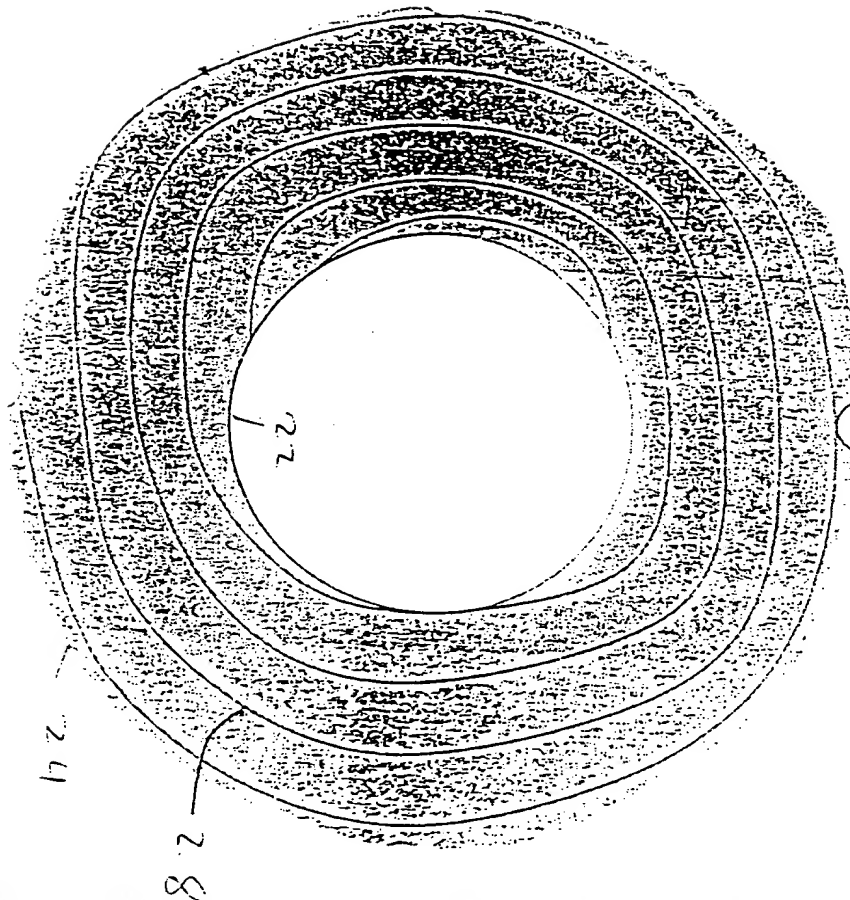
Fig 5



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Fig 3



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